CLAIMS

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A detector **(20)** for a nuclear imaging system **(10)**, the detector comprising:

a plurality of sockets **(44)** which each support an array of individual detector elements **(48)**, each socket including:

a plurality of electrical connectors **(54)**, and

a socket alignment structure **(72)**;

a circuit board **(40)** for receiving sockets **(44)**, which circuit board includes:

a plurality of electrical connection means **(52)** which electrically connect with the electrical connectors **(54)**, and

a circuit board alignment structure **(74)** which mates with the socket alignment structure **(72)** to align the sockets **(44)** and the individual detector elements **(48)** to the circuit board **(40)**; and

a means **(58)** for mounting a collimator **(24)** to the circuit board **(40)** in alignment with the circuit board **(40)**.

2. The system as set forth in claim 1, wherein the socket alignment structure **(72)** and the mating circuit board alignment structure **(74)** includes rigid pins and apertures of like cross-section.

3. The system as set forth in claim 2, wherein the rigid pins are not used for transmitting electrical signals between the sockets **(44)** and the circuit board **(40)**.

4. The system as set forth in claim 1, wherein the collimator mounting means **(58)** includes a frame **(60)** and further including:

an aligning means **(86, 88)** for aligning the frame **(60)** and the circuit board **(40)**.

5. The system as set forth in claim 4, wherein the individual detector elements (48) are separated by interfaces or gaps (68) and wherein the collimator (24) includes mechanical elements (66) which define a plurality of apertures (64), the mechanical elements (66) being aligned with the interfaces or gaps (68) such that the apertures (64) are centered on and aligned with the individual detector elements (48).

6. The system as set forth in claim 4, wherein the aligning means (86, 88) includes:

at least two alignment holes (88) defined in the frame (60), and

at least two matching holes (86) defined in the circuit board (40).

7. The system as set forth in claim 5, wherein the frame (60) has a rectangular face (80) including:

a longer dimension (82), and

a shorter dimension (84),

the at least two frame alignment holes (88) being disposed along the shorter dimension (84) to reduce an effect of thermal dilatation.

8. The system as set forth in claim 1, wherein the socket alignment structures (72) includes rigid pins positioned diagonally from each other.

9. The system as set forth in claim 8, wherein the connectors (54) are pins of relatively soft metal that tend to deform as the sockets (44) are received on the circuit board (40).

10. A method of assembling a detector (20) for a nuclear imaging system (10) comprising:

inserting each of a plurality of sockets (44), which each include an array of individual detector elements (48), a plurality of electrical connectors (54), and socket alignment structures (72) into a circuit board (40) which includes a plurality of electrical connections (52) which electrically connect with the electrical connectors (54) as the sockets are inserted, and circuit board alignment structures (74), which mate with the

socket alignment structures (72) as the socket is mounted to align the arrays of detector elements (48) with the circuit board and each other; and

aligning and mounting a collimator mounting means (58) to the circuit board such that the collimator mounting means is aligned with the arrays of detector elements (48).

11. The method as set forth in claim 10, wherein the collimator mounting means includes a frame (60) which mounts a collimator (24) in fixed alignment thereto, hence to the circuit board (40) and the individual detector arrays (48).

12. The method as set forth in claim 11, wherein the individual detector elements (48) have interfaces (68) therebetween and the collimator has mechanical elements (66), which define apertures (64), the mechanical elements being aligned with the individual detector element array interfaces.

13. A detector (20) for a nuclear imaging system (10), the detector comprising:

a substrate (40) including a plurality of sets of electrically conductive holes (52) and alignment holes (72) of precise cross section; and

a plurality of detector modules (42) each detector module including a plurality of electrically conductive connection pins (54) which are sufficiently soft to tend to bend and rigid alignment pins (74) of the precise cross section, each set of holes being configured to receive one of the modules (42).

14. The apparatus as set forth in claim 13, wherein each detector module (42) includes:

individual detector elements (48) which are electrically connected to the electrically conductive connector pins (54), the individual detector elements being mounted in a rectangular array separated from each other by a rectangular grid of interfaces (68).

15. The apparatus as set forth in claim 13, wherein the substrate (40) defines a plurality of substrate alignment holes (72, 86) and further including:

a frame (60) which defines alignment holes (88, 90), which align with the substrate alignment holes (86).

16. The apparatus as set forth in claim 15, wherein the frame (60) has a rectangular face (80) which includes:

a longer dimension (82), and

a shorter dimension (84); and

the alignment holes including two alignment holes (88) defined in the shorter dimension (84) to reduce an effect of thermal dilatation.

17. The apparatus as set forth in claim 15, wherein the frame (60) includes a collimator mounting means (92, 98) for mounting the collimator (24) in precise alignment therewith, the collimator including:

radiation blocking element (62) that form a rectangular grid which overlays the interface grids (68) of the individual detector elements (48) which are mounted to the substrate (40) when the collimator is mounted in and aligned with the frame that is aligned with the substrate (40).